Amendments to the Claims

This listing of claims replaces all prior versions and listings of claims:

Listing of Claims:

1. (Currently amended) An image forming apparatus, comprising:

a latent image carrier which is able to carry an electrostatic latent image on a surface thereof

a developing section which visualizes the electrostatic latent image on the surface of the latent image carrier with toner and forms a toner image; and

a toner consumption amount calculator which calculates a toner consumption amount consumed by the developing section, wherein

the toner consumption amount calculator ~~calculates the toner consumption amount based on~~ determines a state of a two-dimensional arrangement of a plurality of printing dots formed on the latent image carrier, divides the printing dots into classes depending upon a number of printing dots formed in a predetermined area surrounding the printing dot subject to calculation in the surface of the latent image carrier, counts a number of printing dots classified to the respective classes, multiplies each of the counted numbers of the respective classes by each of weighted coefficients, and accumulates the products of the multiplication, thereby calculating the toner consumption amount, the weighted coefficients being predetermined for the respective classes and corresponding to a toner adhesion amount depending upon a number of adjacent dot in the predetermined area.

2. (Original) The image forming apparatus of claim 1, further comprising:

a latent image forming section which forms a plurality of linear latent images on the latent image carrier of which the positions are different from each other, thereby forming a two-dimensional electrostatic latent image on the surface of the latent image carrier; and

a storage which stores image data which correspond to a plurality of lines of the plurality of linear latent images, wherein

the toner consumption amount calculator determines the state of the two-dimensional arrangement of the plurality of printing dots based on the image data stored in the storage.

3. (Canceled)

4. (Currently amended) The image forming apparatus of claim ~~3~~1, wherein

the toner consumption amount calculator accumulates the toner consumption amount of each of the plurality of printing dots formed during a period of time subject to calculation, thereby calculating a total toner consumption amount during the period of time.

5. (Canceled)

6. (Withdrawn) An image forming apparatus, comprising: an image forming section which visualizes an electrostatic latent image with toner and forms a toner image; and

a toner consumption amount calculator which calculates a toner consumption amount consumed in forming the toner image, wherein

the toner consumption amount calculator varies a mode of a calculation of the toner consumption amount depending upon a distribution state of printing dots to which toner should adhere in the toner image.

7. (Withdrawn) The image forming apparatus of claim 6, wherein

the toner consumption amount calculator determines the mode of the calculation of the toner consumption amount depending upon a size of a distance between the printing dots in the toner image.

8. (Withdrawn) The image forming apparatus of claim 6, further comprising a signal processor which executes a predetermined signal processing to an image signal and generates a control signal for the image forming section, wherein

the toner consumption amount calculator estimates the distribution state of the printing dots based on a content of the signal processing executed by the signal processor, and determines the mode of the calculation of the toner consumption amount based on the estimation result.

9. (Withdrawn) The image forming apparatus of claim 8, wherein

the signal processor is structured to be able to execute a screen processing as the signal processing; the screen processing being a processing to select a screen which corresponds to the image signal from among a plurality of kinds of screens prepared in advance, and to process the image signal using the selected screen, and

the toner consumption amount calculator determines the mode of the calculation of the toner consumption amount depending upon the selected screen.

10. (Withdrawn) The image forming apparatus of claim 9, wherein

in the case where a toner image, which is formed during a predetermined period of time subject to calculation, includes a plurality of areas in which screens different from each other are used, the toner consumption amount calculator calculates the toner consumption amount during the period of time in each of the plurality of areas in the mode corresponding to the used screen.

11. (Withdrawn) The image forming apparatus of claim 6, wherein the toner consumption amount calculator comprises:

a counter which counts the number of a printing-dot group composed of not less than one printing dot arranged in succession or the number of printing dots which compose the printing-dot group; and

a calculating section which calculates the toner consumption amount based on the counted value of the counter.

12. (Withdrawn) The image forming apparatus of claim 11, wherein

the calculating section multiplies the counted value of the counter by a predetermined coefficient which is set depending upon a distribution state of the printing-dot group, thereby calculating the toner consumption amount.

13. (Withdrawn) An image forming apparatus, comprising:

a signal processor which executes a predetermined signal processing to an image signal and generates a printing-dot data regarding an arrangement of printing dots;

an image forming section which forms an electrostatic latent image on a latent image carrier corresponding to the printing dots, and visualizes the electrostatic latent image with toner, thereby forming a toner image which corresponds to the image signal; and

a toner consumption amount calculator which calculates a toner amount consumed in forming the toner image based on the printing-dot data and a state of a two-dimensional arrangement of the printing dots in the electrostatic latent image, wherein

the toner consumption amount calculator varies a mode of a calculation of the consumed toner amount depending upon a content of the printing-dot data.

14. (Withdrawn) The image forming apparatus of claim 13, wherein

the toner consumption amount calculator calculates a toner amount consumed in forming each of the printing dots on the latent image carrier, based on a distribution state of the printing dots in a surface area subject to calculating process which is composed of the printing dot subject to calculation and an adjacent area thereof in a surface of the latent image carrier, and accumulates the toner amount of each of the printing dots, thereby calculating a toner consumption amount of the entire toner image, and wherein

the toner consumption amount calculator varies a size of the surface area subject to calculating process depending upon the content of the printing-dot data.

15. (Withdrawn) The image forming apparatus of claim 14, wherein

the printing-dot data are generated in the signal processing which includes a screen processing and which is executed by the signal processor, and

the toner consumption amount calculator sets the size of the surface area subject to calculating process depending upon a kind of a screen which is used in generating the printing-dot data in the signal processor.

16. (Withdrawn) The image forming apparatus of claim 14, wherein

the toner consumption amount calculator sets the size of the surface area subject to calculating process larger in the case where the printing-dot data are

generated by the signal processor in the signal processing which includes a screen processing, than in the case where the printing-dot data are generated in the signal processing which does not include the screen processing.

17. (Withdrawn) The image forming apparatus of claim 14, wherein

the image forming section is structured to be able to form selectively a monochromatic image with toner of a single color and a color image with a plurality of kinds of toner of which the colors are different from each other, and

the toner consumption amount calculator sets the size of the surface area subject to calculating process larger in the case where the printing-dot data correspond to the color image, than in the ease where the printing-dot data correspond to the monochromatic image.

18. (Withdrawn) The image forming apparatus of claim 13, further comprising a storage which stores the printing-dot data temporarily, wherein

the toner consumption amount calculator determines the content of the printing-dot data based on the printing-dot data stored in the storage.

19. (Withdrawn) The image forming apparatus of claim 13, wherein

the signal processor generates the printing-dot data composed of tone data expressed with multiple data, whereas

the toner consumption amount calculator calculates a frequency of appearance of a printing dot which has a particular tone value based on the printing-dot data, and determines the content of the printing-dot data based on the calculated frequency.

20. (Withdrawn) The image forming apparatus of claim 13, wherein

the signal processor gives information regarding the content of the printing-dot data to the toner consumption amount calculator.

21. (Withdrawn) An image forming apparatus, comprising:

a signal processor which executes a predetermined signal processing to an image signal and generates a printing-dot data regarding an arrangement of printing dots;

an image forming section which forms an electrostatic latent image on a latent image carrier corresponding to the printing dots, and visualizes the electrostatic latent image with toner, thereby forming a toner image which corresponds to the image signal; and

a toner consumption amount calculator which calculates a toner amount consumed in forming the toner image, wherein

the toner consumption amount calculator divides the toner image into a plurality of unit segments having a predetermined size, calculates a toner consumption amount of each of the plurality of unit segments based on the printing-dot data, and accumulates the toner consumption amount of each of the plurality of unit segments, thereby calculating a toner consumption amount of the entire toner image, and wherein

the toner consumption amount calculator varies the settings of the size of the unit segment depending upon a content of the printing-dot data.

22. (Withdrawn) The image forming apparatus of claim 21, wheiein

the toner consumption amount calculator sets the size of the unit segment depending upon a resolution of the toner image corresponding to the printing-dot data.

23. (Withdrawn) The image forming apparatus of claim 22, wherein

the toner consumption amount calculator sets the size of the unit segment smaller as the resolution becomes higher.

24. (Withdrawn) The image forming apparatus of claim 21, wherein

the toner consumption amount calculator sets the size of the unit segment depending upon a kind of a screen which is used in generating the printing-dot data in the signal processor.

25. (Withdrawn) The image forming apparatus of claim 21, wherein

the toner consumption amount calculator sets the size of the unit segment smaller in the case where the printing-dot data are generated by the signal processor in the signal processing which includes a screen processing, than in the

case where the printing-dot data are generated in the signal processing which does not include the screen processing.

26. (Withdrawn) The image forming apparatus of claim 21, wherein

the image forming section is structured to be able to form selectively a monochromatic image with toner of a single color and a color image with a plurality of kinds of toner of which the colors are different from each other, and

the toner consumption amount calculator sets the size of the unit segment smaller in the case where the printing-dot data correspond to the color image, than in the case where the printing-dot data correspond to the monochromatic image.

27. (Withdrawn) The image forming apparatus of claim 21, further comprising a storage which stores the printing-dot data temporarily, wherein

the toner consumption amount calculator determines the content of the printing-dot data based on the printing-dot data stored in the storage.

28. (Withdrawn) The image forming apparatus of claim 21, wherein

the signal processor generates the printing-dot data composed of tone data expressed with multiple data, whereas

the toner consumption amount calculator calculates a frequency of appearance of a printing dot which has a particular tone value based on the printing-dot data, and determines the content of the printing-dot data based on the calculated frequency.

29. (Withdrawn) The image forming apparatus of claim 21, wherein

the signal processor gives information regarding the content of the printing-dot data to the toner consumption amount calculator.

30. (Withdrawn) The image forming apparatus of claim 21, wherein

the toner consumption amount calculator calculates a toner consumption amount of one of the unit segments based on the printing-dot data which correspond to the unit segment subject to calculation and the printing-dot data which correspond to the unit segment adjacent to the unit segment subject to calculation.

31. (Withdrawn) An image forming apparatus, comprising:

a signal processor which executes a predetermined signal processing to an image signal and generates printing-dot data regarding an arrangement of printing dots;

an image forming section which forms an electrostatic latent image on a latent image carrier corresponding to the printing dots, and visualizes the electrostatic latent image with toner, thereby forming a toner image which corresponds to the image signal; and

a toner consumption amount calculator which accumulates a toner consumption amount consumed in forming each of the printing dots on the latent image carrier, thereby calculating a toner consumption amount consumed in forming the toner image, wherein

the toner consumption amount calculator is able to execute a simple count mode and a two-dimensional count mode, the simple count mode calculating the toner consumption amount of each of the printing dots based on the printing-dot data corresponding to the printing dot subject to calculation, the two-dimensional count mode calculating the toner consumption amount of each of the printing dots based on a state of a two-dimensional arrangement of the printing dots on the latent image carrier, and wherein

the toner consumption amount calculator selectively executes either one of the modes depending upon a content of the printing-dot data.

32. (Withdrawn) The image forming apparatus of claim 31, wherein

the toner consumption amount calculator calculates, in the two-dimensional count mode, the toner consumption amount of each of the printing dots based on a state of a distribution of the printing dots in a surface area subject to calculating process which is composed of the printing dot subject to calculation and an adjacent area thereof in a surface of the latent image carrier.

33. (Withdrawn) The image forming apparatus of claim 31, wherein

the toner consumption amount calculator selects the two-dimensional count mode in the case where the printing-dot data are generated by the signal processor

in the signal processing which includes a screen processing, whereas selects the simple count mode in the case where the printing-dot data are generated in the signal processing which does not include the screen processing.

34. (Withdrawn) The image forming apparatus of claim 31, wherein

the image forming section is structured to be able to form selectively a monochromatic image with toner of a single color and a color image with a plurality of kinds of toner of which the colors are different from each other, and

the toner consumption amount calculator selects the two-dimensional count mode in the case where the printing-dot data correspond to the color image, whereas selects the simple count mode in the case where the printing-dot data correspond to the monochromatic image.

35. (Withdrawn) The image forming apparatus of claim 31, wherein

the toner consumption amount calculator selects the two-dimensional count mode in the case where the printing-dot data correspond to a graphic image, whereas selects the simple count mode in the case where the printing-dot data correspond to a character image.

36. (Withdrawn) The image forming apparatus of claim 31, further

comprising a storage which stores the printing-dot data temporarily, wherein

the toner, consumption amount calculator determines the content of the printing-dot data based on the printing-dot data stored in the storage.

37. (Withdrawn) The image forming apparatus of claim.31, wherein

the signal processor generates the printing-dot data composed of tone data expressed with multiple data, whereas

the toner consumption amount calculator calculates a frequency of appearance of a printing dot which has a particular tone value based on the printing-dot data, and determines the content of the printing-dot data based on the calculated frequency.

38. (Withdrawn) The image forming apparatus of claim 31, wherein

the signal processor gives information regarding the content of the printing-dot data to the toner consumption amount calculator.

39. (Currently amended) A toner counter which is used in an image forming apparatus which visualizes an electrostatic latent image on a surface of a latent image carrier with toner and forms a toner image, the toner counter comprising:

a determining section which determines a state of a two-dimensional arrangement of a plurality of printing dots formed on the latent image carrier and divides the printing dots into classes depending upon a number of printing dots formed in a predetermined area surrounding the printing dot subject to calculation in the surface of the latent image carrier; and

a calculating section which calculates a toner consumption amount based on the determination result by the determining section, wherein

the calculating section counts a number of printing dots classified to the respective classes, multiplies each of the counted numbers of the respective classes by each of weighted coefficients, and accumulates the products of the multiplication, thereby calculating the toner consumption amount, the weighted coefficients being predetermined for the respective classes and corresponding to a toner adhesion amount depending upon a number of adjacent dot in the predetermined area.

40. (Canceled)

41. (Withdrawn) A toner counter which is used in an image forming apparatus which visualizes an electrostatic latent image with toner and forms a toner image and which calculates a toner consumption amount consumed in forming the toner image, the toner counter comprising:

a setting section which sets a mode of calculating the toner consumption amount depending upon a distribution state of printing dots to which toner should adhere in the toner image; and

a calculating section which calculates the toner consumption amount in the mode set by the setting section.

42. (Withdrawn) A toner counter which calculates a toner consumption amount in an image forming apparatus which executes a predetermined signal processing to an image signal to generate a printing-dot data regarding an arrangement of printing dots, forms an electrostatic latent image on a latent image carrier corresponding to the printing dots and visualizes the electrostatic latent image with toner, thereby forming a toner image which corresponds to the image signal, the toner counter comprising:

a determining section which determines a state of a two-dimensional arrangement of the printing dots in the electrostatic latent image and sets a mode of calculating the toner consumption amount based on the determination result; and

a calculating section which calculates the toner consumption amount in the mode set by the setting section.

43. (Withdrawn) A toner counter which calculates a toner consumption amount in an image forming apparatus which executes a predetermined signal processing to an image signal to generate a printing-dot data regarding an arrangement of printing dots, forms an electrostatic latent image on a latent image carrier corresponding to the printing dots and visualizes the electrostatic latent image with toner, thereby forming a toner image which corresponds to the image signal, the toner counter comprising:

a calculating section which divides the toner image into a plurality of unit segments having a predetermined size, calculates a toner consumption amount of each of the plurality of unit segments based on the printing-dot data, and accumulates the toner consumption amount of each of the plurality of unit segments, thereby calculating a toner consumption amount of the entire toner image; and

a setting section which varies the settings of the size of the unit segment depending upon a content of the printing-dot data.

44. (Withdrawn) A toner counter which calculates a toner consumption amount in an image forming apparatus which executes a predetermined signal

processing to an image signal to generate a printing-dot data regarding an arrangement of printing dots, forms an electrostatic latent image on a latent image carrier corresponding to the printing dots and visualizes the electrostatic latent image with toner, thereby forming a toner image which corresponds to the image signal, the toner counter comprising:

a counting section which is able to execute a simple count mode and a two-dimensional count mode, the simple count mode calculating the toner consumption amount of each of the printing dots based on the printing-dot data corresponding to the printing dot subject to calculation, the two-dimensional count mode calculating the toner consumption amount of each of the printing dots based on a state of a two-dimensional arrangement of the printing dots on the latent image carrier; and

a selecting section which selects either one of the modes depending upon a content of the printing-dot data and make the counting section execute the selected mode.

45. (Currently amended) A method of calculating toner consumption amount in an image forming apparatus which visualizes an electrostatic latent image on a surface of a latent image carrier with toner and forms a toner image, the method comprising the steps of:

determining a state of a two-dimensional arrangement of printing dots formed on the latent image carrier;

dividing a plurality of printing dots formed on the latent image carrier into classes depending upon a number of printing dots formed in a predetermined area surrounding the printing dot subject to calculation in the surface of the latent image carrier;

counting a number of printing dots classified to the respective classes; and

calculating a toner consumption amount ~~based on the determination result~~ by multiplying each of the counted numbers of the respective classes by each of lighted coefficients, and accumulating the products of the multiplication, the lighted coefficients being predetermined for the respective classes and corresponding to a

toner adhesion amount depending upon a number of adjacent dot in the predetermined area.

46. (Withdrawn) A method of calculating toner consumption amount, in an image forming apparatus which visualizes an electrostatic latent image with toner and forms a toner image, which calculates a toner consumption amount consumed in forming the toner image, the method comprising the steps of:

setting a mode of calculating the toner consumption amount depending upon a distribution state of printing dots to which toner should adhere in the toner image; and

calculating the toner consumption amount in the set mode.

47. (Withdrawn) A method of calculating toner consumption amount which calculates a toner consumption amount in an image forming apparatus which executes a predetermined signal processing to an image signal to generate a printing-dot data regarding an arrangement of printing dots, forms an electrostatic latent image on a latent image carrier corresponding to the printing dots and visualizes the electrostatic latent image with toner, thereby forming a toner image which corresponds to the image signal, the method comprising the steps of:

setting a mode of calculating the toner consumption amount based on the printing-dot data and a state of a two-dimensional arrangement of the printing dots in the electrostatic latent image; and

calculating the toner consumption amount in the set mode.

48. (Withdrawn) A method of calculating toner consumption amount which calculates a toner consumption amount in an image forming apparatus which executes a predetermined signal processing to an image signal to generate a printing-dot data regarding an arrangement of printing dots, forms an electrostatic latent image on a latent image carrier corresponding to the printing dots and visualizes the electrostatic latent image with toner, thereby forming a toner image which corresponds to the image signal, the method comprising the steps of:

dividing the toner image into a plurality of unit segments of which the size is set depending upon a content of the printing-dot data;

calculating a toner consumption amount of each of the plurality of unit segments based on the printing-dot data; and

accumulating the toner consumption amount of each of the plurality of unit segments, thereby calculating a toner consumption amount of the entire toner image.

49. (Withdrawn) A method of calculating toner consumption amount which calculates a toner consumption amount in an image forming apparatus which executes a predetermined signal processing to an image signal to generate a printing-dot data regarding an arrangement of printing dots, forms an electrostatic latent image on a latent image carrier corresponding to the printing dots and visualizes the electrostatic latent image with toner, thereby forming a toner image which corresponds to the image signal, the method comprising the steps of:

selecting either one of a simple count mode and a two-dimensional count mode depending upon a content of the printing-dot data, the simple count mode calculating the toner consumption amount of each of the printing dots based on the printing-dot data corresponding to the printing dot subject to calculation, the two-dimensional count mode calculating the toner consumption amount of each of the printing dots based on a state of a two-dimensional arrangement of the printing dots on the latent image carrier; and

calculating the toner consumption amount consumed in forming the toner image in the selected mode.

50. (New) The image forming apparatus of claim 2, wherein the storage stores image data that correspond to three lines of the linear latent images including a scanning line on which the printing dot subject to calculation exists and one line each of before and after thereof.